

Quodsi mora centri ♀ in disco suppo-      <sup>h</sup>      1      "        
 nitur 4 h. 32'. erit inclinatio orbitæ      0      7      6        
 Si vero eadem mora esset 4 h. 34'.      —      —      0      7      5        
 tunc inclinatio orbitæ

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IX. *Observations upon so much of Monsieur le Monnier the younger's Memoir, lately presented to the Royal Society, as relates to the communicating the Electric Virtue to Non-electrics; by Wm. Watson, F. R. S.*

Read Jan. 29. 1746-7. THE World is much obliged to Mons. *le Monnier* for the many Discoveries he has made of the Power of Electricity; though the Reason of my troubling you with this Paper at this time, is my differing with that Gentleman in the Conclusions which he deduces from several of the Experiments contain'd in his Memoir lately presented to the *Royal Academy of Sciences at Paris*, his own Extract of which was lately communicated to the *Royal Society*. \*

One of the Questions proposed to be examined is,  
 " In what manner the electric Virtue is to be communicated to such Bodies as yet have it not, and  
 " which are not capable of acquiring it by bare Friction only?" Monsieur *le Monnier* observes hereupon, " That no other Manner is known, by which the electric Virtue may be communicated, besides the near Approach of a Body actually pos-  
 " ses'd of the same: That the Rule laid down by  
 " Monsieur

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\* See These Transactions, No. 181, p. 291.

“ Monsieur *du Fay*, *That Bodies never receive Electricity by Communication, unless they are supported by Bodies electric in their own Nature, does not always take place; and that it is liable to great Exceptions:*” For, first, in the *Leyden* Experiment, the Phial filled with Water is strongly electrified by Communication, even when carried in the Hand, which is not a Body electric by Nature.”

To this I answer, that Monsieur *du Fay*’s Rule is confirmed by all the Experiments yet made public, and even by that of *Leyden* quoted by our Author, or what is usually called that of Professor *Muschenbroeck*. For, in this Experiment, is not the non-electric Water contained in and supported by the glass Phial, which is electric in its own Nature? Its being carried in the Hand is no more than its being placed on any other non-electric Body, and therefore is no Proof against the general Position. It is well known, that if the Phial is made non-electric by wetting its Outside, so as not to leave some Inches perfectly dry, between its Mouth and that Part which is wetted, the Water and Phial part with the Electricity as fast as they receive it, unless it is stopped by another Electric *per se*. But of this I treated at large, in a Paper I lately did myself the Honour to communicate.

Secondly, our Author mentions, “ That all Bodies, which are electrified by means of a Phial of Water fitted to a Wire, and which has already received a great deal of Virtue by Communication; all Bodies, he says, placed in any curve Line, connecting the exterior Wire and that Part

“ of

“ of the Bottle, which is below the Surface of the  
 “ Water, acquire Electricity without being placed  
 “ upon Resin, Silk, Glass, or the like : That thus  
 “ a violent Concussion may be given to 200 Men  
 “ all at once ; who holding each other by the  
 “ Hand so form the Curve just mention'd, when  
 “ the first holds the Bottle, and the last touches the  
 “ Wire with the End of his Finger ; and this equally,  
 “ whether they are all mounted upon Cakes of Re-  
 “ sin, or stand upon the Floor : That the Electricity  
 “ has in this manner been carried through a Wire  
 “ of the Length of 2000 Toises, or near  $2\frac{1}{2}$  English  
 “ Miles ; Part of which Wire dragged upon wet  
 “ Grass, went over Hedges, Palisado's, and over  
 “ Land newly ploughed up.”

The Experiments in the second Argument do no-ways invalidate Monsieur *du Fay's* Rule ; for the Success of them depends upon keeping whatever forms the curve Line mention'd by our Author, whether it consists of Men or Wire, in a non-electric State : And if whatever forms this curve Line acquires any Degree of Electricity more than its original Quantity, which it is well known may be done, by being placed upon originally Electrics, the Effect of the Shock is proportionably lessened. Thus if a Man, standing upon Electrics *per se*, applies his Hand to the Phial of Water, suspended by a Wire to the electrified Gun-barrel as usual, this Person will acquire Electricity, which will be sufficiently perceptible in him, by his attracting light Substances held near his Body, or by his firing inflammable ones, when properly presented to him ; if, I lay, a Person thus electrified, by applying one  
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of his Hands to the Phial, touches the electrified Gun-barrel with a Finger of his other, let the Phial be ever so strongly electrified, he feels but a slight Stroke ; and this Stroke is greater or less, in proportion to the Difference of the Accumulation of Electricity in the Body of the Man, and that of the Water in the Phial. Thus we know from Experiment, that though a considerable Quantity of the Electricity, in impregnating the Phial of Water therewith, pervades the Glass, yet the Loss thereof this Way is not equal to what comes in by the Wire : Therefore we will, for the sake of a more easy Method of Explanation, suppose, that the Phial, when electrified in the most perfect manner, contains a Quantity of Electricity equal to 10 ; that the Man's Body, by standing upon Wax, and touching the Phial with one of his Hands during its Electrification, contains a Quantity equal to 7 : Upon his touching the Gun barrel with a Finger of his other Hand, he will receive a small Stroke only equal to 3, the Difference of the Electricity of the Water and that of his Body : And if he touches the Gun-barrel again, without removing his Foot from the originally Electric, the Stroke will be scarcely perceptible, on account of his Body being nearly of the same Degree of Electricity with the Water in the Phial. So that here we see that the Violence of the Shock, to be felt by whatever forms the curve Line, depends upon its being, in the most perfect manner, free from any Degree of Electricity more than the original Quantity ; which is contrary to the Opinion of our Author.

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Thirdly,

Thirdly, Monsieur *Monnier* tells us, " That the Water of the Basin of the *Thuilleries*, whose Surface is about an Acre, has been electrified in the following manner:

" There was stretched round half the Circumference of the Basin an iron Chain, which was entirely out of the Water; the two Extremities of this Chain answer'd to those of one of the Diameters of the Octagon: An Observer, placed at one of these Extremities, held the Chain with his left Hand, and dipped his right at the same time into the Water of the Basin; whilst another Observer, at the opposite Side of the Basin, held the other End of the Chain in his right Hand, and a Phial well electrified in his left. He then caused the Wire of his Phial to touch an iron Rod, fixed upright in a Piece of Cork that floated near the Edge of the Basin. At that Instant both Observers felt a violent Shock in both their Arms. The same Fact was again confirmed by Experiments made upon two Basins at the same time, that it might appear distinctly, that the electrical *Effluvia* did really pass along the Superficies of the Water."

The Water of the Basin in this Experiment was no more electrified than the Wire which dragged along the Ground, &c. was in the former. When I was first informed, without being acquainted how, that an Acre of Water had been electrified, I was amazed, and told the Gentleman who acquainted me therewith, that if my Idea of Electricity was in the least true, such an Effect could not be produced, without electrifying the whole terraqueous Globe from

from a larger Mass of Matter. And indeed, when I heard Monsieur *le Monnier*'s Paper read, I easily saw the Deception : So that, instead of electrifying the whole Quantity of Water contain'd in the Basin, the Electricity pass'd only through so much of it as formed a Line between the iron Rod fastened in the floating Cork, and the Hand of that Observer which was dip'd in the Water.

These Experiments still more and more establish the Account I lately laid before you of the Electricity's always describing the shortest Circuit between the electrified Water and the Gun barrel ; or (which is the same thing) the Wire of the electrified Phial. And this Operation respects neither Fluids or Solids, as such, but only as they are non-electric Matter. Thus this Circuit, in the preceding Experiment between the Phial and the Wire, consisted of the two Observers, the iron Chain, the Line of Water, and the iron Rod in the floating Cork.

Fourthly. Monsieur *le Monnier* mentions, " That " it has been confirmed, by repeated Comparisons, " that a Bar of Iron, placed in the above-mention'd " Curve, does not at all acquire more Electricity " when it is suspended in silken Lines, than when " it is held in the bare Hand : Whence it appears to " him, that, in this Case, the contiguous non- " electric Bodies do neither partake of, nor absorb " in any way, the Electricity which has been com- " municated."

The curve Line before-mention'd, let it consist of whatever Non-electrics it will, unless the Whole thereof be properly supported, the communicated Electricity cannot be accumulated : So that the sus-

pending one Part thereof in silk Lines cannot be supposed to produce any Effect.

This Gentleman further observes, “ That the Phial of Water fitted to its Wire does not receive the least Degree of Electricity, if its Wire, suspended by a silk Line, is applied to the Globe in Motion, or if that Phial is placed upon a dry glass Stand.” This Monsieur *le Monnier* takes to be directly contrary to Monsieur *du Fay*’s Rule ; especially as the Phial cannot be replete with Electricity, unless, while it is exciting, some non-electric Body touches the Phial below the Water.

That the Phial of Water receives no Degree of Electricity in this Case is not strictly true : It receives as much as any other Mass of Matter of the same Bulk would, under the same Circumstances. For we find, that we cannot highly electrify the Water, unless the Electricity from the Globe be directed through the Water and Phial to the Non-electric in Contact ; in which Passage a great Quantity thereof is accumulated, by its not pervading the Glass so fast as it is furnished by the Wire ; and therefore we find, that when the Water will contain no more, the Surcharge runs off by the Wire : So that this Experiment, no more than those which precede, contradicts Monsieur *du Fay*’s Opinion ; the Thinness of the Glass permitting it, not wholly, but partially, to stop the Electricity. This Matter is explained further under Experiment the first.

I differ from this ingenious Author with Reluctance, inasmuch as I greatly honour him, not only for his Discoveries upon the Subject of Electricity, but also for the Pleasure and Improvement I received in

in my reading his learned and curious Observations in Natural History, made in the Southern Parts of *France*, where he accompanied Monsieur *Cassini de Thury* in measuring a Degree of the Meridian. These Observations are published with Monsieur *Cassini's* Book: But as the reverse of several of the Opinions deliver'd in his Memoir is experimentally found to be true, and as the Discovery of Truth, and carefully separating it from Deception, should be the only Aim of our Philosophizing, I take the Liberty of laying before you my Opinion thereon.

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X. *Abstract of a Letter from Mr. William Arderon, F. R. S. to Mr. Henry Baker, F.R.S. concerning the perpendicular Ascent of Eels.*

*Norwich, July 9. 1746.*

*S I R,*

*Read Jan. 29. 1746-7.* **W**HEN I read, some Years ago, what Dr. *Plot* in his History of *Staffordshire* relates concerning the Passage of Eels across Meadows, in the Night time, from Pond to Pond, I could hardly forbear thinking, that the Gentleman there mention'd must by some means or other have been deceived; but what I have lately seen with my own Eyes gives me great Reason to believe his Account to be strictly true.

On the 12th Day of last *June*, whilst I was viewing the Flood-Gates belonging to the Water-works in this City of *Norwich*, I beheld a great Number of